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Twentieth Century System of Notation.

CALCULATIONS MADE EASY.

The Octimal System

—OF—

Notation and Numeration.

COMBINING SIMPLICITY WITH THE GREATEST PRACTICAL UTILITY.

GEO. H. COOPER.

NEW WESTMINSTER, B. C., CANADA,
January, 1901.

Price 25 Cts.

THE COLUMBIAN COMPANY, LTD.

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PREFACE

In placing this little work before the public I feel that I am but carrying out the promptings of an All-Wise Creator whose laws are all definite in character and who for some inscrutable reason seems often to choose persons occupying humble positions in life to bring into notice methods of working that tend to the higher development of the human intellect and to a more thorough understanding of his great work in the creation.

I early observed that all phenomena were subject to the control of some law, whether understood or obscure, and when in the demonstration of it apparent aberrations occurred. They were due to the operation of another law of equal importance.

Hence it becomes necessary to seek for causes of error in order to acquire a correct knowledge of natural law, and also to bring into operation correct methods of acquiring the fullest amount of knowledge within our reach.

The decimal system of notation is not a scientific method of making calculations, because it is not definite in character and requires the assistance of other methods of conveying ideas of proportional numbers. The octimal system seems to answer all requirements of mathematical science and if it leads to a wider knowledge and higher attainments I shall feel amply repaid for my effort in producing it.

THE AUTHOR.

INTRODUCTION

The present age is one of research and enquiry. Man looks with enquiry into the Past, the Present and the Future. No field of experiment or discovery is shut out of his circle of investigation. Certain it is that this spirit of enquiry has already resulted in large additions to the facts of conscious knowledge in the reduction of many complex forms to their proper elements, and in the simplification of methods heretofore laborious and cumbersome. Machines have taken the place of the human hand and eye, where dexterity, exactness, or careful and accurate discrimination were demanded, the weakness of man's muscle being insufficient for great works. The activity of man's mind has been called into operation, with the result that new forces have been found and new machines constructed for the accomplishment of mighty work. In laboratory, in shop, in counting house, and in fact in every department of labor, the skill of the manipulator and the discoveries of the investigator, have resulted in a system or method of operation which has greatly increased the efficiency of the laborer and the value of the work he has done.

But while men have sought out new inventions and followed new methods or revised old ones it has been too often the case that the simple has been sacrificed to the novel and there has been foisted upon an unsuspecting public many laborious and tedious methods of study or mechanical operation simply to introduce the novel and peculiar or to push the sale of some man's wares.

Such can exist no longer for the spirit of the present age demands practical utility, produced in the simplest manner possible as the distinguishing characteristic of

every system or method seeking a recognized place in the operations of the busy life of today. To this end all our appliances and methods now in use are being subjected to a rigid inspection which will result in clearing them of the fog of all useless and unnecessary accretions, or discarding them altogether, in order that place may be given to simpler forms and such as are better adapted to the demands of the present day.

Such investigation, looking to simplicity of method, has been made already in many departments of Science and Art, but one field has scarcely been touched, namely that of the Science of Numbers. It does not seem to have occurred to anyone that our present methods in numbers are woefully deficient in their adaptability to even the simplest mechanical operations, and involve such labor to master as is quite out of reach of the ordinary individual, or if such has already presented itself to any mind the result has not been the presentation of anything simpler in Numeration. This may have been due to the fact that our present system of notation being based upon the unit, it has been thought that there could be no simpler basis, and such is true, but we find that while we are to-day building upon such a simple basis, simplicity gives place to the greatest complexity when we view the structure that has been reared on such a basis. Now while it is true that a too rigid simplicity may lack that efficiency necessary to any adequate system in any branch of knowledge, it must be conceded, that if the same efficiency can be retained, the simplifying of any system is a desideratum. There is nowhere, perhaps, greater need for simplicity than in the field of Mathematics of today. Our present system is so lacking in its methods of divisibility that it is of little use in many mechanical operations where measurements are required, while many of its rules and forms of calculation are puzzling to young minds and often to those of mature

thought as well. Now a simpler system, with a greater adaptation to the needs of practical life, and one which can be mastered in a much shorter time is required and such we believe has been found in the Octimal System of Notation.

We do not hesitate to claim that this system is of more practical utility than any other, that it will render calculations comparatively easy and that its forms will be easier to retain in the minds of one and all.

Disadvantages of the Decimal System.

The Decimal System of Notation, was developed long before Practical Science and Mathematics were factors of any importance in the affairs of every-day life. Nothing was required of the system but that it might be applied conveniently to numerical calculations. Certainly our present system meets this requirement admirably, but no better than, if as well as, a system with a radix of eight as advocated in this treatise.

When in later centuries these theoretical calculations became of vast importance in almost every realm of human activity, it was found that the amount of labor entailed in their practical application was enormous. Sciences were developed individually and it was found very difficult to express the results of calculations in one department, so as to make them of practical value in another, for instance, the unit of time, which is the basis of Horology, bears no direct relation to the unit of circular measurement, which is the basis of the science of Navigation, nor do units of weight bear any necessary relation to units of volume. The adoption of the French Metric System would, it is true, reduce the above-mentioned labor to a minimum so far as is possible with a decimal notation, but that the system is utterly unsuited to the demands of industry is proven by the fact that those who are engaged in mechanical operations, do not and will not make use of it, and are opposed to its adoption since it is deficient in its adaptability to their requirements.

I. The majority of men cannot understand the division of an object into parts other than halves, quarters,

etc. It is only an exceptional individual who can, with any degree of accuracy, divide a length or a volume, into three, five or ten equal parts. The adoption of a decimal system of measurements then means simply this, that men will be unable by any ordinary means, at their disposal, to divide objects into the number of parts necessary for expressing their ideas or results in words or figures, for instance, in such divisions as three-tenths, seven hundredths or four twentieths, it is difficult for men to appreciate the relation of such parts to a whole.

II. In shop-work in the manipulation of mechanical tools the principle underlying the Octimal System is in actual use and is the only reasonable and practical way of working. Threads and sub-measurements are expressed in halves, quarters, eighths, sixteenths or other even parts, and this is exactly the fundamental idea of the Octimal Notation.

The adoption of the French Metric System means, necessarily, the entire discarding of the mechanical appliances at present in use, and the manufacture of new ones with methods of division most difficult for practical application and still of little improvement, even theoretically on the present system. This is the reason for the refusal of the British manufacturers to adopt the Metric System. They have said: "We have altogether too much at stake to consider the matter until the advantages of the change are more apparent." We might suggest that theorists and educationalists aim to meet the demands of industry rather than to force visionary ideas upon practical men.

CURRENCY.

III. The currency system of many countries at present, is based upon a decimal system of notation. Such a system of currency is found, in its ease of calculation, to be vastly superior, to that in use in the British Isles, so

much so indeed, that the present American system seems to be almost a perfect one; and its advantages are certainly very great, but its disadvantages though correspondingly great, are nevertheless unnoticed because the decimal coinage is as perfect as our present system of notation will allow. However a moment's thought will convince anyone of the inconvenience and even absurdity of the use of coins whose values do not bear the same relations to one another as do the fractions of articles bought and sold. Everyone has experienced the annoyance caused by the absence of coins of the value of two and a half, twelve and a half, sixty-two and a half cents, etc. Our present commercial system calls for the values above mentioned, but as yet it has been found impracticable to circulate coins representing such values. The inconvenience of such an imperfect system has led many communities to ignore many fractional values, substituting for the same the next highest or lowest whole number. For instance, an article whose value is 12½c, is given for convenience the value of 12c or 13c. This, it is evident, means a serious loss, in a short time, to the one party in any business transaction, while it means a corresponding gain to the other. Supposing, however, that coins representing the above values were in circulation, the inconvenience of calculations involving such values would not be removed except in special cases. Commercial life demands a coin whose value is 12½c; and yet such a coin would be an annoyance in numerical calculations. It is within the mark to say that the value of any article or part of an article, actually called for in practice, could be met, conveniently in Octimal Currency Coin. Moreover the values of such coins would lend themselves readily to the needs of business calculations.

Many other disadvantages of the decimal system could be mentioned, a few of which are referred to in a later paragraph.

The Octimal System Explained.

This system, as its name implies, will indicate to all who are familiar with the term "decimal," one which expresses numbers in terms of groups of eight, or powers of eight. In such a system, eight will become the radix instead of ten, as in the present system. Perhaps it may seem clearer to say that, whereas the decimal system is based upon the recurrence of the unit from one to ten, the Octimal System has but eight such units in its basis. This suggests, at once, a simplified system of notation as compared with the decimal system, inasmuch as the basis is reduced to a simpler form. Furthermore, anyone who is at all acquainted with numbers, knows that the names and the number of figures used in expressing our successive numbers from one to ten, and even of many beyond ten, are quite arbitrary. The immense amount of labor necessary to the young student involved in the learning of our present system of notation, is evident to any thoughtful mind. This is due to the fact that the system itself, in method and nomenclature, proceeds on lines that are contrary to recognized principles of human thought. Moreover, the methods of teaching numbers now in use are contrary to the first principles of Pedagogy and must remain so, as long as the present system is in use, for the methods used are the result of an irrational system to be taught and not to a defective knowledge of how to teach. For instance, when a child has mastered the meaning of the name "one" he is not helped by this knowledge in the understanding of the name "two." When "1" and "2" are learned and in a succeeding lesson appear as "12," a new name is given, "twelve" which in the child's mind neither bears any relation, nor has any similarity of sound to the terms

"one" and "two." We are not now speaking of numerical relations for we do recognize that such follow in proper order of thought development so that when one has learned the significance of "2" and "10" as numbers, their numerical relation, of which the figures "12" are the expression, follows in natural order. But the name "twelve" used to express the number "12" has not such similarity to the names "one" and "two" as suggests these to be the figures required. As a result, the majority of students make their knowledge of numbers from this point onward, a mere matter of memory. It would seem proper that when a name is used to express a combination of figures, it should clearly suggest those figures in the order in which they are grouped. We are not now concerned with the many other disadvantages of the decimal system, thinking it best to leave the discussion of these to a later paragraph.

In the notation and numeration which we now propose, it is true that, as in the present system, the names and symbols used as far as eight bear no relation to each other, but for succeeding numbers not only are the terms to be next used directly suggested but also the names and symbols are in complete harmony with each other.

We append a brief outline of the Octimal System of nomenclature, giving the numerical equivalent of each name as found in both Octimal and Decimal Notation.

	Octimal Figures.	Decimal Figures.
one	1	1
two	2	2
three	3	3
four	4	4
five	5	5
six	6	6
seven	7	7
eight	10	8
et-one	11	9
et-two	12	10
et-three	13	11

	Octimal Figures.	Decimal Figures.
et-four	14	12
et-five	15	13
et-six	16	14
et-seven	17	15
two-et	20	16
twoet-one	21	17
twoet-two	22	18
Etc., Etc., Etc.		
threet	30	24
fouret	40	32
fivet	50	40
sixet	60	48
sevenet	70	56
etred	100	64
etred one	101	65
etred eight	110	72
etred etone	111	73
etred twoet	120	80
Etc., Etc., Etc.		
two etred	200	128
three etred	300	192
etand	1,000	512
etion	1,000,000	$(512)^2$

A further extension of the nomenclature suggested may be made by anyone without difficulty. The names of higher periods, billions, trillions, etc. might well be retained.

Before arranging our nomenclature for numbers below the Octimal point we shall point out some advantages in the nomenclature outlined above.

It will be seen that the figures "8" and "9" have been discarded and that eight has now for its numerical equivalent "10" instead of "8." The terms beginning with "et one" readily suggest the figures which are to stand as their numerical equivalents, for instance, "et six" suggests at once the figures "16." Furthermore, the order of syllables throughout the whole nomenclature is in harmony with the figures to be used; thus "etred twoet-six" is naturally represented by the figures "126."

Such a suggestiveness of figures to be used is not by any means so evident in many of the terms of the deci-

mal system, e. g., "eleven" in no way suggests the figures "11," nor does "twelve" suggest "12." Moreover, in thirteen, fourteen and successive terms, not only is there a lack of suggestiveness of the number expressed, but the first figure suggested is a three or a four, whereas the first to be written is one.

It takes the majority of children a year or more to understand the meaning of the terms from thirteen to nineteen and the change in method of naming, from nineteen to twenty-one. One can see, at a glance, that the proposed system of nomenclature is more rational than that now in use and can be mastered in much less time than is required to master our present system.

For the expression of terms that lie on the right of the Octimal point, a similarity of nomenclature suggests itself. The first place to the right would be called "eths," the second, "etredths;" the third, "etandths;" the fourth, "eths of etandths," and so on. Thus, the following number would be read as indicated: 654.654 is six etred fivet four and six etred fivet four etandths. We would suggest, however, that a system of spelling be adopted for all terms or the right of the Octimal point, for instance, instead of "six etred fivet four etandths," say "point six five four, .6 now means six eighths or eths, a division of the unit more easily comprehended than tenths, being also such a division, as can be readily made with ordinary mechanical appliances.

The fractional names quarter, half, and three-quarters may still be used if desired, but will be smybolized thus .2 .4 .6, the figures representing the actual value of the term, and the equivalent of 2-8, 4-8, 6-8. 1-16 in the present system will be 1-20 in the Octimal, written thus: .04 for calculation, or four etredths equal 4-100 for verbal comparison.

Another saving of labor will be seen in that greatest

of difficulties for young minds, the multiplication table. Instead of eleven or nine tables being required for calculation but seven are now to be used. Moreover the two most difficult are done away with. We subjoin the multiplication table as it will appear in the Octimal System:

Twice	Three Times	Four Times	Five Times	Six Times	Seven Times	Eight Times
1 are 2	1 are 3	1 are 4	1 are 5	1 are 6	1 are 7	1 are 10
2 " 4	2 " 6	2 " 10	2 " 12	2 " 14	2 " 16	2 " 20
3 " 6	3 " 11	3 " 14	3 " 17	3 " 22	3 " 25	3 " 30
4 " 10	4 " 14	4 " 20	4 " 24	4 " 30	4 " 34	4 " 40
5 " 12	5 " 17	5 " 24	5 " 31	5 " 36	5 " 43	5 " 50
6 " 14	6 " 22	6 " 30	6 " 36	6 " 44	6 " 52	6 " 60
7 " 16	7 " 25	7 " 34	7 " 43	7 " 52	7 " 61	7 " 70
10 " 20	10 " 30	10 " 40	10 " 50	10 " 60	10 " 70	10 " 100

It will be seen at once that such a multiplication table as we have outlined will be much more easily mastered by the beginner than that in use at present. Moreover for such as have already learned the table now in use the change to that of the new system will be easily effected. It is evident that a considerable change will be necessary in the whole realm of numbers, if the new system is adopted, but inasmuch as such adoption will probably not be made for sometime to come, it could be anticipated by the gradual mastering of the new system and by its introduction at first within certain limitations. And we would even advocate its adoption at once, believing that whatever difficulties might arise in the radical change that would ensue such would be more than counterbalanced by the greater convenience and practical value of the new system. That it would render necessary a change in an almost unlimited area of life is no argument against its adoption inasmuch as if it is a simpler system and has an adaptability to the requirements of life equal to that of the decimal system the claim of future generations makes its adoption imperative. We hope to show, however, in a later paragraph that it has

not only simplicity in its favor, but that its adaptability to every department of life where calculations of any kind are required, surpasses that of any other system that has yet been used among men. Many of our present most difficult measurements, as well as the calculations in Horology, Astronomy and Navigation, etc., which are now possible only to advanced scholars will be found to appear as self-evident facts, without the aid of any process of calculation.

The System Applied.

The extent of our present treatise will not al[low] to enter into the details of the practical application [of the] system to all departments of Mathematics. We [shall], however, indicate such features of its applicability [as] will assure our readers, that in this respect the system is in no way deficient and perhaps in so doing we may sugges[t] the methods to be pursued in cases of applicat[ion] not here specified. We shall briefly outline the me[thod] by which the system may be applied to Weights, Measures Horology, Astronomy and Navigation, since [these] subjects are of greatest practical importance, and of m[ost] interest to the general public. We believe we can sh[ow] clearly that the Octimal System besides having adva[n]tages in theoretical calculation, also surpasses all oth[er] systems in its harmony with the laws and principles [of] nature, as well as with the various operations of the hu[m]an mind. To pursue the investigation of such harmony would be a most delightful task, but the limits of our space forbids.

I. The system as applied to Weights and Measures.

(a) Weights—We do not find it necessary to pro-

pose a change in the present units of weight. The pound avoirdupois would remain the standard as at present. But we would change the division of the pound into eight (10) parts instead of twoet (our present sixteen), as being simpler and more in harmony with the whole Octimal System. The most suitable higher unit would be etand (1,000, our present 512) pounds for which we might still retain the term "ton." It is well known that our present ton is too large, to serve as a convenient unit, and that it is not fitted to practical life, inasmuch as it does not represent a fair wagon load of any of the commodities in general use.

Much credit has been claimed for the French Metric System, because of the so-called connection between its measures of weight and of volume. The gram which is the unit of weights in this system is fixed as the weight of water at a temperature of 4 degrees C., which is contained in one cubic centimetre, the unit of volume. But as water changes its weight, materially, with a change of temperature, it is clear that we can arrive at an approximate idea only of the weight of a known volume of water. The one convenience of the units in the French System is that one is able to calculate the weight of a known volume of a substance by simply multiplying the number expressing this volume by the specific gravity of the substance.

But surely by a comparatively small amount of work specific gravities might be expressed with reference to a solution of a certain strength, one cubic inch of which weighs one ounce. This would furnish us with all the theoretical advantage of the French system and at the same time save us from the annoyance which the introduction of such a system would cause in its demand for a universal change in our present units of weight. The new table of weights would appear as follows:

10 grains make 1 scruple. 10 ounces make 1 pound.
10 scruples make 1 drachm. 1,000 pounds make 1 ton.
10 drachms make 1 ounce.

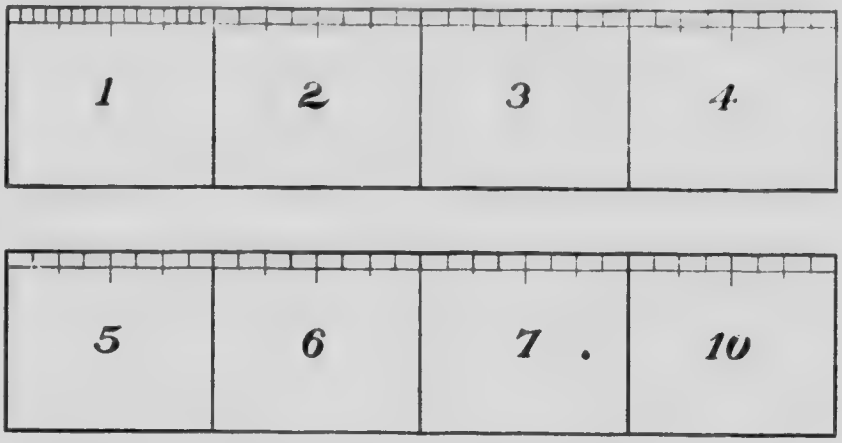
The adaptation of this table to our weights in present use would not be difficult as the pound remains unchanged while the ounce is simply double its present value.

(b) Measures —

I. Linear and surface measurement.

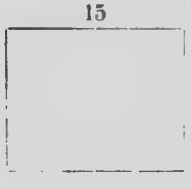
The object of any change in our system of measurement is to overcome the necessity of multiplications and

One foot Rule (shown in two sections)



divisions in changing from one denomination to a lower or higher one. To accomplish this it is not at all necessary to change our units of measurement. The present units, the inch and foot, are too closely connected with industrial appliances and pursuits to allow of a change being made if it can in any way be avoided. For convenience of calculation let eight (10) inches be called a foot and eight (10) feet be called a yard; then our present two-foot rule will become a three-foot rule. This would make the cubic foot to contain etand (1,000), our present 512 cubic inches, and the square foot, etred (100), our

present 64 square inches. Thus in square measure the first two places of an ordinary number would represent square inches and the remaining ones square feet. For instance, if we require the number of square feet and inches in a given rectangle. By the Octimal System this would be determined as follows:



Length, 15 in. x Breadth, 12 in. = 202 sq. in.
= 2.02 sq. ft.

15
12
32
15
202

We are thus relieved of the labor of division, for the determining of the number of square feet and inches contained in a surface becomes merely a matter of inspection, when the number of square inches has been ascertained by multiplication.

In the case of cubic measurements, the first three figures would represent cubic inches, and the remaining ones cubic feet. If the larger surface measure corresponding to our present acre is to be an even number of etands or etions of square feet, it will be necessary to change the size of the acre. But this is merely a change in ideas and does not concern any mechanical appliance except the surveyors' chain.

MEASURES OF CAPACITY.

It is very confusing to have measures of capacity which bear no direct relation to units of cubic measurement. It so happens that the new cubic foot will contain nearly 7½ quarts. Let the quart measure be slightly reduced in size, so that eight quarts will equal one cubic foot, which might be called as a measure of capacity, a "peck." We would recommend that the eighth of the quart be called a pint and that the largest measure of

capacity be etand pecks, which might be called a "tank." The measure of capacity will then appear as follows:

10 cubic inches equals 1 pint. 10 quarts equals 1 peck.
10 pints equals 1 quart. 1000 pecks equals 1 tank.

The calculation of the number of cubic inches in a substance, from its dimensions would then at the same time determine the number of pecks or quarts contained in it. For instance if a vessel contain 64532 cubic inches its capacity is 2 inches, 3 pints, 5 quarts and 64 pecks.

Moreover, knowing the specific gravity of the substance in terms of our standard solution a simple multiplication will give us its weight. It will thus be evident that, by the Octimal system, all the advantages of the French Metric System are secured to us, without the necessity of the changes demanded by the latter in weights and measures, which changes are so great as to be almost impracticable.

CURRENCY.

It is a well-known fact that there is a desire among civilized nations for a universal coinage. If such is realized it is more than probable that the British "sovereign" will become the standard, as it is even now, practically a standard the world over. Now it so happens that eight (10) British half-crowns make one sovereign, thus giving us a coin conveniently large and as perfectly suited to calculations as the coins of a decimal currency. The British half-penny is not far from our etredth (our present 64th) of the half-crown. Thus we have a base coin ready until the perfect octime or cent could be minted. Hence by ceasing to use shillings in making calculations the British people have coin, already, which, in the new notation, would not demand those multiplications and divisions by twelve and twenty.

A very convenient arrangement and one in harmony with the present currency system of Great Britain would

be to make the half-crown serve as the American dollar. Then eight (10) dollars would make one sovereign; the half dollar would then be 40 cents, the quarter 20 cents and for convenience we would have eight and four and two-cent pieces also, the present English penny being used as a two-cent piece.

We recognize that this would mean a considerable change in our present coinage, but it is such an one as is necessary and advisable for it is in harmony with British values and indirectly with those of most other countries. It is impossible to harmonize our Decimal coinage with the sterling system, or the sterling system with a decimal notation, so that if a universal coinage is sought a radical change in the systems of most countries is absolutely necessary. The change in coinage which we suggest is in no sense a serious matter as no depreciation of values results and further, it will be an easy matter to become accustomed to the use of the coins suggested as they will be very similar, in appearance, to those now in circulation.

EXAMPLES.

To find the number of pounds, dollars and cents in any number of units, mark off the last two places to the right for cents and the next one for dollars; the others are pounds.

	£ d c	
Thus:	64.5.32	British currency.
	E $ c	
Then also	64.5.32	American currency.
	yds. ft in.	
	645 . 3 . 2	Lineal measure.
	ft. in.	
	645.32	Square measure.
	ft. in.	
	64.532	Cubic measure.
	tk. pk. q. p. i.	
	17.464.5.3.2	Measure of capacity liquid.
tc	lbs. oz. dr. sc. gr.	
1 .	746 . 4 . 5 . 3 . 2	Weights.
	days hrs. m. s.	
	17 . 46 . 45 . 32	Time.
	R. ° ′ ″	
	17.46.45.32	Circle.

CONVENIENT BRITISH COINS.

Gold —£=Eight (10) dollars... .....Present half crowns
Silver —Dollar=Etred (100) cents..... " half pennys
" —Half Dollar=Fouret (40) cents.....To be minted
" —Quarter Dollar=Twoet (20) cents..... "
" —Eighth Dollar=Eight (10) cents..... "
Nickel—Four (4) cents..... "
Copper—Two (2) cents.....Penny
" —One (1) cent.....Half Penny

Florins and Shillings 6,4 and 3 penny pieces can be used to make up Dollars until withdrawn from circulation.

CONVENIENT AMERICAN COINS

Gold —Eagle=Eight (10) dollars..... To be minted
Silver —Dollar=Etred (100) cents..... Present Dollar
" —Half Dollar=Fouret (40) cents..... " 50c
" —Quarter Dollar=Twoet (20) cents..... " 25c
" —Eighth Dollar=Eight (10) cents..... To be minted
Nickel —Four (4) cents .... "
Copper—Two (2) cents..... "
" —One (1) cent .... "

Value of Gold Coin in Octimal Figures:

$ 5 pieces=Five (5) dollars
$10 pieces=Et-two (12) dollars
$20 pieces=Twoet four (24) dollars

HOROLOGY, ASTRONOMY AND NAVIGATION.

To such as are at all acquainted with the present methods of calculation in Astronomy and Navigation, it will be evident that some simpler method is desirable. Moreover, there is no uniformity between the divisions of the dial and those of the circle. Now all the above sciences are based upon the divisions of the circle and since they are so inter-related, that each is constantly in demand in determining results in the others, it is certainly advisable that, in their operations they should proceed on similar methods. It is a very difficult matter at present to express time in terms of distances on the earth's surface, owing to the lack of direct relation between

hours and degrees. The Octimal System at once suggests the following divisions of the circle:

(100) etred seconds make 1 minute.
(100) etred minutes " 1 hour or degree.
(100) etred hours " 1 day or complete revolution.

No objection could be made to this division of the circle for although the new seconds as applied to the circle would be about five times as large as at present, yet the Octimal divisions would be as conveniently read by the new vernier scale as are the present decimal divisions. The divisability of the circle by such a method will be at once apparent. It will now be possible to obtain by simple bisection any angle required. This may be done with mathematical precision and at the same time by the only method of division of angles known to geometricians. At present no angles expressed by whole numbers except those of 15 degrees, 30 degrees, 45 degrees, 60 degrees can be measured without the use of methods that are practically equivalent to guess-work and which are wholly unscientific. Furthermore the method of the Octimal system makes the circle the exact counterpart of the Mariner's Compass.

The system outlined above presupposes one revolution of the hour hand in our present time of twenty-four hours. This would necessitate of course a com-

pletely new set of time-pieces or at least a new set of works in the old cases. The time-pieces at present in use could be gradually replaced by those with the new-marked dial. The new divisions of the dial would mark this period of time off into 100 divisions or hours, thus making the hour nearly three-eighths of its present length. A considerable advantage will thus be gained in the reading of time, for instance the symbols A. M. and P. M. will be unnecessary, for no confusion can arise as to whether 3 o'clock means 3 A. M. or 3 P. M. By the new divisions eight (10) hours would signify our present 3 A. M., while 50 o'clock would indicate our present 3 P. M., etc. It may be thought that such a number of divisions on the dial will make the telling of time more difficult; but if we make the hour-hand the longer one, the hour can be seen at a glance and the minutes need to be expressed but approximately, since they have become comparatively small.

The determination of longitude and latitude becomes a very simple process instead of the intricate and difficult problem it presents. Conversion of time into longitude is now entirely discarded and all that is required is to add or subtract the necessary corrections to or from the sextant readings or tables direct. This method is very much to be preferred to our present system and has an incalculable advantage over the French Metric System, which will if adopted be a constant source of confusion to navigators. At present four minutes of time corresponds to one degree of longitude, while in the Metric System there is no integral relation between minutes of time and degrees. The new second on a great circle will be about 500 feet present measure.

Transformation from Decimal to Octimal Notation.

For a considerable time to come, books will be in common use, wherein the decimal system is used for all numerical values. Many of these will never be reprinted but, nevertheless, will remain as valuable works of reference. It becomes necessary therefore that some method of ready transformation should be known to every individual. During such time as the new system is being adopted throughout any country, people will be making transformations continually; many of these will, of necessity, have to be accurate, but in the great majority of cases, some rough approximation would be quite sufficient.

The mathematical method of transforming a number from one system, where it is expressed in terms of powers of "ten" to another with radix "eight" may be found in most text-books on algebra in the chapter on "Scales of Notation."

The operation consists, simply, of successive divisions by eight carried on, of course, in the decimal system, in which the number is already expressed; the remainders from the various divisions will be the figures constituting the required expression in the new system. e. g.

8)1000000
8)125000—0
8)15625—0
8)1953—1
8)244—1
8)30—4
3—6

Thus the number of objects represented by 1,000,000

in the decimal system is represented by 3,641,100 in the Octimal System.

Comparative tables, showing numbers in ordinary use (say up to 500 or 1,000) expressed in the two systems, might be prepared and placed in all books of ordinary literature. This would mean no appreciable addition to the cost of a book and would serve occasionally as a convenient reference. Numbers higher than these give only a very vague idea, at best, to the human mind; hence a lesson or two on what we might call "Imaginative proportions" would be ample to give anyone a sufficient idea of how any large number, expressed decimally, would be expressed in the Octimal System. For instance, 10,000 in our present notation would be 23420 in the new; one hundred thousand becomes three etreds and three etands, two etred fouret and so on. Thus any number of thousands or millions could be roughly expressed with but little mental effort.

The greatest objection that can be raised to the introduction of a new system of notation will be that all mathematical books and tables will have to be renewed at considerable trouble and expense. However, the expense would be trifling compared with the loss in the value of machinery entailed by the introduction of the Metric System and, moreover, it will soon be repaid by the gain in labor and efficiency. The trouble will be borne by men whose time is given to educational work and not by business men or mechanics. Then, too, it will be some years before either the French Metric or an Octimal system could be introduced and by that time, new editions of all the most useful books would be required and the change could be made as they were printed. Even the task of preparing a new table of logarithms, with the multitude of double transformations necessary, is, comparatively a small undertaking.

In the transition period it would be necessary to have a working acquaintance with both systems. This would mean some additional work and perhaps bewilderment, though neither would be unreasonably great compared with the confusion arising from a complete change in weights and measures.

CONCLUSION.

We have now outlined in brief for our readers the Octimal System of Notation and Numeration and have shown its application to a few departments of knowledge, more especially to those in practical life. There are many matters of detail that must necessarily be omitted in a pamphlet such as the present one. We trust we have made it clear, however, that the system, as far as notation is concerned is perfect and admirably adapted to all the needs of calculation. Changes have been made, but all such have in their favor the claim of simplicity and in no case is anything lost in accuracy. Such a system, whose simplicity makes it possible for the young student to master it in a much shorter space of time than is required to master our present system, has a claim for recognition by every fair-minded man. Again the transformation from the decimal to the Octimal system can be so readily accomplished that no book at present in our libraries will lose anything of value, since all its numerical expressions may be at once converted into terms of the Octimal System. Furthermore, the Metric System is being thrust upon us more or less forcibly, a system whose advantages we must recognize but whose disadvantages are also most apparent. The Octimal System, as we have said before, furnishes us with all the theoretical advantages of the French System while at the same time leaving us free from the great annoyance of a com-

plete change in our present weights and measures and the mechanical appliances involving them.

We therefore offer the Octimal System to the public without any doubt as to its effciency and with the belief that it is better adapted to the nçcessities of Commercial life than any system heretofore published.

WEEKLY COLUMBIAN.

New Westminster, B. C. February 20, 1901.

THE OCTIMAL SYSTEM.

What Columbian College Professors Say About the New System of Notation.

To the Editor of The Columbian:

Sir: In a recent issue of your valuable paper, the Faculty of Columbian College was referred to in an article, "Mathematical Revolution." For the benefit of your many readers we subjoin a brief statement concerning the new system of notation.

The origin of the system, and its application to many departments of mathematics and science, more especially to the sciences of horology, astronomy and navigation, are the work of Captain Cooper, of this city. The principle of the system was submitted to us some months ago, during which time we have sought to find how widely extended its application might be to all departments where calculations are necessary as well as to ascertain whether any defect could be discovered which would render it an imperfect system of notation. We are now prepared to state that as a system of notation, it is perfect, and that in its application to all forms of calculation it is eminently superior to any system heretofore known to mankind. We have been able, in our developments of the system to discover at every turn, how its adoption will simplify our present methods of mathematical operation, and render significant to the most ordinary intelligence, terms and expressions heretofore almost meaningless or of little practical value. Many of our laborious tasks, especially such as require the use of vulgar fractions, methods of deduction, etc., will be practically discarded, while divisions are now possible with accuracy, which before could only be determined approximately, if at all.

It will be safe to say that not only will the work of ordinary calculation be greatly reduced and simplified, but that many important operations will be brought within the limits of our public schools that now belong to higher mathematics. We think the ease with which such a system can be mastered by the young student, as well as the simplification of laborious methods, will at once be evident from the following:

First.—The multiplication table will be reduced to seven tables.

Second.—By this system, the figures which form any expression will be at once suggested by the naming of the ex-

pression. This is not so at present, e. g.: When we say eleven, there is nothing to suggest one, one. Twelve is another example, and thirteen, fourteen, and many succeeding expressions are illogical and imperfect in their suggestiveness of the numbers required.

Third.—Reduction in many forms will be found unnecessary. If I know a surface measurement to be 546 square inches, we will not require division by 144 to determine the number of square feet, but will know at once by inspection that 5.46 is the number of square feet contained in such surface.

Fourth.—Weights and measures of capacity have been so harmonized that when we know by measurement the volume of a vessel, we determine its capacity by inspection, and its weight by multiplying the volume with the specific gravity of the substance.

Many other examples might be advanced, but the above will be sufficient to show the immense advantage of using the octimal system of notation.

There is at present an agitation for the adoption of the French metric system, which, if adopted, will make an entire change in our units of weight and measurement. Moreover, the French system is ill-adapted to mechanical pursuits, besides rendering useless all our present graduated mechanical appliances.

The octimal system will secure to us all the theoretical advantages of the metric system, as well as adapt itself perfectly to all our mechanical appliances and operations, without any fundamental change in our unit of measurement of weight. Such a system, we feel assured, will become the notation of the future, inasmuch as it is the simplest and most practical method ever discovered.

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